

Serial No. 10/694,511
January 17, 2005
Reply to the Office Action dated October 19, 2004
Page 6 of 9

REMARKS/ARGUMENTS

Claims 1-10 and 15-23 are pending in this application. By this Amendment, Applicants AMEND claim 1, cancel claims 11-14 and add claims 15-23.

Applicants appreciate the Examiner's indication that claim 3 would be allowable if rewritten in independent form including all of the features of the base claim and any intervening claims. Applicants have added new claim 15, which corresponds to claim 3 rewritten in independent form including all of the features of base claim 1. In addition, Applicants have added new claims 16-23 which depend upon allowable claim 15.

Claim 13 was rejected under 35 U.S.C. § 112, second paragraph, for allegedly being indefinite. Applicants have canceled claim 13. Accordingly, Applicants respectfully submit that this rejection is moot.

Claims 1, 2, 4-10 and 14 were rejected under 35 U.S.C. § 102(b) as being anticipated by Khan et al. (US 2002/0109226). Claims 11-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Khan et al. Claims 11-14 have been canceled. Applicants respectfully traverse the rejection of claims 1, 2 and 4-10.

Claim 1 has been amended to recite:

"A cavity-down ball grid array package comprising:
a flexible circuit tape including a flexible tape laminated to a conductor layer, the flexible circuit tape having an aperture therein;
a thermally conductive heat spreader directly fixed to a first surface of the flexible circuit tape, the heat spreader having a cavity aligned with the aperture of the flexible circuit tape;
a semiconductor die mounted to the heat spreader, in a die-down configuration in said cavity;
a thermally conductive die adapter fixed to said semiconductor die such that a portion of said die adapter protrudes from said cavity;
a plurality of wire bonds connecting said semiconductor die to bond sites on said second surface of said flexible circuit tape;
an encapsulating material encapsulating said semiconductor die and said wire bonds; and
a plurality of solder balls disposed on a second surface of the flexible circuit tape, in the form of a ball grid array,
wherein **the die adapter is comprised of one of silicon and**

Serial No. 10/694,511

January 17, 2005

Reply to the Office Action dated October 19, 2004

Page 7 of 9

silicon coated with a solderable layer.” (emphasis added)

The Examiner alleged that Khan et al. teaches all of the features recited in claim 1. In addition, the Examiner alleged that “it would have been obvious to one of ordinary skill in the art at the time the invention was made to use NiFe or silicon coated with solderable layer such as Cr, Ni and Au for the die adapter of Khan et al, since it has been held to be within the general skill of a worker in the art to select known material on the basis of its suitability for the intended use as a matter of design choice.” Applicants respectfully disagree.

Claim 1 has been amended to recite the feature of “the die adapter is comprised of one of silicon and silicon coated with a solderable layer,” which was previously recited in originally filed claim 11.

In contrast to the Examiner's allegations, Khan et al. clearly and specifically teaches in paragraph [0031] on page 2 that the “package stiffener” and “heat spreader” (which the Examiner alleged corresponds to the die adapter recited in Applicants' claim 1) are manufactured from the same material to prevent bending of the integrated circuit die due to differences in thermal expansion coefficient. Khan et al. clearly teaches that using the same material on each side of the die cancels bending motions that would otherwise be imparted to the die. Khan et al. further teaches in paragraph [0039] on page 3 that the package stiffener/heat spreader is typically made of a metal or a combination of metals, such as copper, tin and aluminum, or may be made from a polymer, for example.

Thus, not only does Khan et al. fail to teach or suggest the use of a silicon die adapter or a die adapter including silicon coated with a solderable layer, but Khan et al. also teaches away from the use of such a die adapter since Khan et al. teaches that the same metal material must be used on each side of the semiconductor die, and this same material does not include silicon or silicon coated with a solderable layer. The Examiner is reminded that it is error to find obviousness where references diverge and

Serial No. 10/694,511
January 17, 2005
Reply to the Office Action dated October 19, 2004
Page 8 of 9

teach away from the invention at hand. W.L. Gore & Assoc. v. Garlock Inc., 220 USPQ 303, 311 (Fed. Cir. 1983).

Accordingly, Applicants respectfully submit that (1) Khan et al. clearly fails to teach or suggest the feature of "the die adapter is comprised of one of silicon and silicon coated with a solderable layer" as recited in Applicants' claim 1, and (2) it would not have been obvious to use silicon or silicon coated with a solderable layer for the die adapter, as alleged by the Examiner, because Khan et al. specifically teaches away from the use of silicon or silicon coated with a solderable layer.

Accordingly, Applicants respectfully submit that Khan et al. fails to teach or suggest the unique combination and arrangement of elements recited in claim 1 of the present application.

In view of the foregoing amendments and remarks, Applicants respectfully submit that claim 1 is allowable. Claims 2-10 depend upon claim 1 and are therefore allowable for at least the reasons that claim 1 is allowable. Claim 15 is allowable as indicated by the Examiner. Claims 16-23 depend upon claim 15 and are therefore allowable for at least the reasons that claim 15 is allowable.

In view of the foregoing amendments and remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

Serial No. 10/694,511
January 17, 2005
Reply to the Office Action dated October 19, 2004
Page 9 of 9

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

Date: January 17, 2005


Attorneys for Applicants

Joseph R. Keating
Registration No. 37,368

Christopher A. Bennett
Registration No. 46,710

KEATING & BENNETT LLP
10400 Eaton Place, Suite 312
Fairfax, VA 22030
Telephone: (703) 385-5200
Facsimile: (703) 385-5080